

What is a force?

- Something acting on an object
- change acting on obj.
- push or pull that moves an obj.
- measure in Newtons

Force \rightarrow action on an object
that causes it to change
states

What are types of forces?

- Push or pull → applied
- Gravitational
- Friction
- Drag (air, water)
- Lift
- Centripetal
- Thrust
- Magnetism
- Electric
- Sound
- Electromagnetic
- Strong
- Weak
- Normal
- Tension
- Spring

Ways to apply forces:

1. Contact:

- Applied
- Friction
- Normal
- Tension
- Thrust
- Spring
- Drag
- Lift

2. Field:

- Electromagnetic
- Gravity
- Strong
- Weak

Newton's Laws:

1. An object at rest or in motion
Will stay at rest or in motion unless
acted upon by an outside force.

"Law of Inertia"

2. $\sum \vec{F} = m\vec{a}$

Net Force = sum of all forces
in one direction

$\sum \rightarrow$ Sigma, means "sum of"

3. Forces come in pairs.

Short Derivation of Newton's 2nd Law:

— Start with impulse-momentum theorem.

$$\overline{F} \Delta t = m \Delta \overline{v}$$

$$\overline{F} = m \left(\frac{\Delta \overline{v}}{\Delta t} \right) = \overline{a}$$

$$\overline{F} = m \overline{a}$$

Equilibrium v. Non-Equilibrium:

- Equilibrium \rightarrow forces balance each other

$$\Sigma \vec{F} = \emptyset$$

- NO acceleration!
- Happens in two ways:

1. Not moving
2. constant velocity

- Non-equilibrium \rightarrow unbalanced forces producing a net force

$$\Sigma \vec{F} = m\vec{a}$$